REMARKS

This paper is responsive to a Final Office Action dated July 22, 2005. Prior to this response, claims 1-20 were pending. After amending claims 1, 5, and 13, and canceling claims 4, 12, and 20, claims 1-4, 6-11, and 13-19 remain pending.

The Office Action has rejected claims 1, 3-5, 11, and 12 under 35 U.S.C. 102(e) as anticipated by Gnadinger (US 6,674,110). With respect to claims 1 and 5, the Office Action states that Gnadinger describes all the elements recited in the claims including a conductive oxide layer. With respect to claims 4 and 12, the Office Action states that Gnadinger describes a conductive oxide layer made from a conductive perovskite oxide, a high temperature superconducting oxide, or an oxide film made from a metal selected from the group consisting of Mo, W, Tc, Re, Ru, Os, Rh, Ir, Pd, Pt, In, Zn, Sn, Nd, Nb, Sm, La, and V.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Claims 1 and 5 have been amended to specifically recite a list of possible conductive oxide materials. None of the materials on this list are described by Gnadinger. Gnadinger generally describes his interfacial layer 31, which the Office Action calls a conductive oxide, to be a mixture of a rare earth oxide A_xO_z with a silicon oxide S_vO_w (col. 7, ln. 41-44). In Gnadinger's claim 7, an alternate definition of interfacial layer is presented where A is selected from the group comprising Y, Ce, Pr, Nd,

Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, or Sc having the general formula of AxSiyOz. Using either of Gnadinger's formulas, Gnadinger's interfacial layer *must* include the element of Si. As noted in the Applicant's previous response, Gnadinger's interfacial layer is not conductive, but rather is a dielectric with a dielectric constant of at least 10.

None of the conductive oxide materials added to Applicant's claims 1 and 5 include the element of Si. Therefore, none of the interfacial layer materials mentioned by Gnadinger are recited in Applicant's claims 1 and 5. As a result, Gnadinger does not explicitly describe every aspect of the Applicant's claims. Since Gnadinger does not explicitly describe every limitation of the claims, he cannot anticipate claims 1 and 5. Claim 3, dependent from claim 1, and claim 11, dependent from claim 5, enjoy the same distinctions from the cited prior art and the Applicant requests that the rejection be removed.

Claims 2 and 6 have been rejected under 35 U.S.C. 103(a) as being unpatentable with respect to Gnadinger in view of Willer et al. ("Willer"; US 6,538,273). The Office Action acknowledges that Gnadinger does not describe a bottom conductive layer, but states that Willer describes a ferroelectric transistor with a bottom conductive layer. The Office Action also states that Willer and Gnadinger are in the same field of endeavor, that the purpose disclosed by Willer would have been recognized in the pertinent art of Gnadinger, and that it would have been obvious to modify Gnadinger to add a bottom conductive layer to improve the punch-through voltage. This rejection is traversed as follows.

An invention is unpatentable if the differences between it and the prior art would have been obvious at the time of the invention. As

stated in MPEP § 2143, there are three requirements to establish a *prima facie* case of obviousness.

> First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. *In re Vaeck* 947 F.2d 488, 20 USPQ2d, 1438 (Fed. Cir. 1991).

Willer describes a ferroelectric transistor with a metallic intermediate layer made up of an interfacial layer 4_1 of WSi_2 and an overlying metal layer 4_2 of platinum (col. 5, ln. 6-12). The ferroelectric layer 5 overlies the platinum. With respect to the first *prima facie* requirement, there must be some suggestion in Willer to perform modifications on the Gnadinger reference that make the claimed invention obvious. The Office Action states that the purpose disclosed by Willer would have been recognized in the pertinent art of Gnadinger, making it obvious to modify Gnadinger. However, this assertion cannot be supported.

On a general level, the motivation to combine references cannot be based upon the assertion that they are in the same field of endeavor. If this was true, then any two references could be combined merely on the basis of a keyword search. Rather, there must be a specific teaching in one reference that suggests a modification to a different reference. Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion of

motivation in the references to do so." *In re Mills*, 916 F.2d 680, 682, 16 USPQ2d 1430, 1432 (Fed. Cir. 1990). Therefore, an analysis should have been preformed to determine if Willer suggests any specific modifications to Gnadinger.

In his Background Section, Willer notes that a conventional ferroelectric (FE) transistor uses an insulating oxide layer to improve the interface between the Fe and semiconductor substrate. However, the penalty associated with the use of such an insulating oxide layer is added capacitance, which reduces the voltage drop across the FE layer (col. 1, ln. 26-54). Willer's solution to this problem is to add a Schottky diode between the FE layer and the substrate (col. 2, ln. 11-34). Gnadinger addresses the same issue with a completely different solution; he uses a (non-conductive) oxide with a dielectric constant higher than that of a conventional dielectric material, such as SiO2 (col. 3, ln. 8-28). Therefore, it is not logical to contend that a reference (Willer) that teaches the use of a Schottky diode, can suggest a modification to a different reference (Gnadinger) that is seeking to solve a similar problem using a higher dielectric constant material. In fact, the references can be said to be pointing away from each other. Stated another way, an improvement in punch-through voltage, as suggested by Willer, would work against the effects sought by Gnadinger, whose interfacial layer 31 increases capacitance.

Considered from the perspective of the second *prima facie* requirement, even if an expert were given the Gnadinger and Willer inventions as a foundation, there is no reasonable expectation that this expert could derive the claimed invention. It is not clear how a layer that

is being using as part of a Schottky diode by Willer, can be used for a different purpose by Gnadinger.

With respect to the third *prima facie* requirement, even if the Willer and Gnadinger inventions are combined in retrospect, the combination does not describe any of the conductive oxides listed in claims 1 and 5. Therefore, the combination of references does not explicitly describe all the elements of the claimed invention, or suggest a modification that makes claims 1 and 5 obvious. Claim 2, dependent from claim 1, and claim 6, dependent from claim 5, enjoy the same distinctions over the cited prior art references and the Applicant requests that the rejection be removed.

Claims 7-10 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Gnadinger in view of Moon (US 5,744,374). The Office Action acknowledges that Gnadinger fails to disclose a multilayer gate stack, but states that this feature is described by Moon. The Office Action also states that Moon and Gnadinger are in the same field of endeavor, that the purpose disclosed by Moon would have been recognized in the pertinent art of Gnadinger, and that it would have been obvious to modify Gnadinger to use a multilayer gate stack. This rejection is traversed as follows.

Moon describes a structure very similar to Gnadinger – an oxide layer (Y2O3) 11a over the substrate, an FE layer 12a over layer 11a, and a top electrode 13a over layer 12a. These layers are essentially the same as Gnadinger's layers 31, 30, and 50. With respect to the first and second *prima facie* requirements, even if the references were combined, the only modification suggested is the use of Y2O3 as an interfacial dielectric.

With respect to the third *prima facie* requirement, even if the Moon and Gnadinger inventions are combined, the combination does not describe any of the conductive oxides listed in claim 5. Therefore, the combination of references does not explicitly describe all the elements of the claimed invention, or suggest a modification that makes claim 5 obvious. Claims 7-10, dependent from claim 5, enjoy the same distinctions over the cited prior art references and the Applicant requests that the rejection be removed.

Claims 13 and 15-20 have been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Gnadinger in view of Sakai et al. ("Sakai"; US 2003/0067022). The Office Action acknowledges that Gnadinger fails to disclose a replacement gate stack, but that this feature is described by Sakai. The Office Action also states that Sakai and Gnadinger are in the same field of endeavor, that the purpose disclosed by Sakai would have been recognized in the pertinent art of Gnadinger, and that it would have been obvious to modify Gnadinger to use a replacement gate stack. This rejection is traversed as follows.

Sakai describes a fabrication process using a replacement gate structure. Except for a general mention of the processes that can be used to deposit the interfacial layer 31 (col. 7, ln. 51-65) and some details of the FE deposition conditions (col. 7, ln. 66, through col. 8, ln. 41), Gnadinger is almost silent as to fabrication details. Therefore, it cannot be ascertained if Sakai's processes have any application to Gnadinger's structure. For example, Sakai's resultant structure is very different in shape than Gnadinger's, and it is unlikely that the same processes apply to both structures. As another example, Gnadinger states that the FE material must be deposited during the formation of the transistor (col. 6,

ln. 64, through col. 7, ln. 1). However, Sakai forms his source and drains regions (see Fig. 2D well before the deposition of FE 5 (see Fig. 2H).

With respect to the third *prima facie* requirement, even if the Sakai and Gnadinger inventions are combined in retrospect, the combination does not describe any of the conductive oxides listed in claim 13. Therefore, the combination of references does not explicitly describe all the elements of the claimed invention, or suggest a modification that makes claim 13 obvious. Claims 15-19, dependent from claim 13, enjoy the same distinctions over the cited prior art references and the Applicant requests that the rejection be removed.

Claim 14 has been rejected under 35 U.S.C. 103(a) as unpatentable with respect to Gnadinger in view of Sakai and Willer. The Office Action acknowledges that Gnadinger fails to disclose a bottom conductive layer, but states that Willer describes such. The Office Action also states that Willer and Gnadinger are in the same field of endeavor, that the purpose disclosed by Willer would have been recognized in the pertinent art of Gnadinger, and that it would have been obvious to modify Gnadinger to use a bottom conductive layer to improve the punch-through voltage. This rejection is traversed as follows.

As noted above, there is no suggestion to combine the Willer and Gnadinger references. In fact, the two references appear to offer completely different solutions to a common issue. Therefore, it is not apparent how, or why an expert could modify Gnadinger, to add Willer's bottom conductive layer. Likewise, it has been noted above that there is no apparent suggestion that Gnadinger can be modified in light of the Sakai reference.

With respect to the third *prima facie* requirement, even if the Sakai, Willer, and Gnadinger inventions are combined in retrospect, the combination does not describe any of the conductive oxides listed in claim 13. Therefore, the combination of references does not explicitly describe all the elements of the claimed invention, or suggest a modification that makes claim 13 obvious. Claim 14, dependent from claim 13, enjoys the same distinctions over the cited prior art references and the Applicant requests that the rejection be removed.

In view of the foregoing, applicant requests reconsideration of the application and requests that it be passed to issue.

Respectfully submitted,

Date: 10/4/2005

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